

Remarks

In the Office action of October 9, 2008, the drawings were objected to because Figure 8 reads "Figur 8" instead. Likewise, the specification was objected to under 35 U.S.C. 112, first paragraph, as being "replete with terms which are not clear, concise and exact" (examples from page 1 of the specification being indicated in item 2 of the Office action).

It is apparent from these comments, notably the misspelling of "Figur" and the example from page 1, line 25 ("ingreasing") that the Examiner has not referred to the replacement pages submitted during the international stage of this PCT application, which is already part of the PTO record for this case under "2006-01-04 Documents submitted with 371 Applications", namely the pages appended to the International Preliminary Examination Report. These previous changes to the application (Article 34 amendments) during the international stage, which the PTO already has in its file wrapper, should be considered part of the U.S. national stage of this PCT application. (See MPEP 1893.01(a)(3)) However, for the drawings, in order to ensure that a clean version meeting the formality requirements is available, Applicant submits the drawing set, including the corrected sheets.

As for the specification, except for a few minor errors on page 1, (line 7, "communicational" should be "communication"; line 11, "complecity" should be "complexity"; and line 12, the British English term "Tele" not used in the United States should be changed to "voice"), Applicant does not find any other needed changes beyond those already made in the international stage. The newly found changes are implemented by amendment herein.

Claims 12 and 24 were also objected to because of informalities. The suggested changes are made by amendment herein.

Claim 14 was rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement in regard to how to take derivatives of states of polarization. In the context of the claimed subject matter this is clearly a mathematical time-derivative, i.e., change of polarization state as time passes. For example, as stated on page 20, lines 6-12 and 15-16, "When a QoS packet arrives at the input of the switch, a change in the state of polarization will be detected. Hence, it is known that it is a QoS packet. At the end of a QoS packet, the state of polarization has to be changed back to the 'best effort state' so that when the QoS packet has passed the polarization monitor, the switch will know the end of the packet. ... Since the start and stop of the QoS packets is detected only by change in state of polarization, and QoS packets will never be passed to the buffer, there is no need to know the content of the information in the QoS packets." Applicant amends claim 14 by replacing "derivative" with "change".

Claims 1, 2, 4-8, 15, 18, 19, 21, 22, and 25-27 were rejected under 35 U.S.C. 103(a) as being unpatentable over Kodialam et al. (US 2002/0018264) in view of Van Der Tol (US 5,900,957).

Kodialam teaches a wavelength division multiplex (WDM) optical network 100 that uses standard signaling and messaging techniques between the packet and optical layers to dynamically request wavelength paths from the optical network, thereby enabling online routing of packets using either previously set-up (existing) wavelength paths or setting up new wavelength paths for the arriving bandwidth request. (par. [0025]) Received LSP requests specify an ingress node and an egress node, as well as a required bandwidth (or

service level) for the connection. (par. [0028]) The LSP request is defined by three fields (o_i , t_i , b_i), where the third field specifies the amount of bandwidth required or the service level guarantee, such as quality of service (QoS), translated into an effective bandwidth value. (par. [0048]).

Thus, Kodialam teach a method for setting up wavelength-paths in a wavelength-routed optical network, where packets may have a QoS labeling in a header field. The Office action correctly indicates that "Kodialam does not teach transmitting different QoS signals on different states of polarization." Moreover, Applicant notes that, since the packet's QoS is labeled by a separate header field within the packet, Kodialam also fails to teach indicating a packet's QoS by the transmitted wavelength (or polarization state) of that packet. Even in Kodialam's WDM method, there is no specific correspondence of particular transmissive wavelengths to packet QoS levels, whereby the QoS information would be carried by a packet's wavelength. Thus, even if Van Der Tol's teachings were to be applied to Kodialam in a polarization multiplexing scheme as suggested in the Office action, it would not go so far as to obtain QoS representation by a packet's polarization state.

Van Der Tol teaches an optical packet-switched network in which, by the application of polarization as a physical quantity, the address field signal can be separated from the packet (data) signal in the optical domain. (Col. 3, lines 12-20) Thus, in a polarized packet signal, the address signal and the corresponding data signal have the same wavelength but different (preferably mutually orthogonal) polarizations, designated as A_1 and I_0 respectively. (Col. 6, lines 1-13). Van Der Tol uses the state of polarization to differentiate the address and payload fields of a packet. However, Van Der Tol does not teach the indication of a packet's QoS by the polarization state itself. If Van Der Tol

provides any QoS information, it would be found as part of the address field but not represented by the polarization. The polarization state in Van Der Tol merely distinguishes the address field from the payload (data) field of the packet.

The subject matter of the network arrangement in independent claim 1 and its dependent claims and of the method set forth in independent claim 18 and its dependent claims involves "transmitting packets of a first QoS class in a first state of polarization and transmitting packets of a second QoS class in a second state of polarization". Applicant does not claim polarization multiplexing and demultiplexing in a packet switched network *per se*, nor the separation of different fields of a packet (e.g., address header and its data payload) by polarization, as applied by Van Der Tol. The claimed subject matter provides a novel application of polarization multiplexing directed to separating and routing complete packets according to their QoS class. Such packets may include both header (e.g., including an address field) and payload (data load) with the QoS class of the complete packet indicated by its polarization state. Alternatively, the packets could also be separated into header and payload components, but rather than distinguishing these separate components by polarization, as in Van Der Tol the polarization state of both components would instead represent their QoS class.

The claims dependent upon the independent claims 1 and 18 incorporate by reference all of the features set forth in those independent claims. Accordingly, the dependent claims should be patentable for the reasons given above. Additionally, the dependent claims recite further features which are asserted to be patentable for the reasons given below.

Regarding claim 2 and 19, while separating address and data (head and packet body) by polarization is known, as

in Van Der Tol, simultaneously using a state of polarization both for header/packet separation and also for QoS classification of the packet is novel and nonobvious, the QoS class being represented by the polarization state of the packet body while the header may take another polarization.

Regarding claims 4 and 21, while the polarization states separating header and packet in Van Der Tol may be orthogonal, doubling the bit rate, the claimed orthogonal states in the present application are applied to solve a different problem, namely QoS separation.

Regarding claims 5 and 22, while Kodialam describes wavelength multiplexing and demultiplexing, the claimed multiplexing and demultiplexing by means of polarization is fundamentally different, and in any case is applied here to QoS classification of whole packets, which is a solution to a completely different problem.

Regarding claim 6, the Office action states (page 7): "Van Der Tol further teaches a communication network arrangement wherein the network further comprises at least one core node adapted to split the received packets by polarization and to separate packets according to the packets state of polarization." (citing Van Der Tol, col. 6, lines 42-52) This is not correct. It is not complete packets that are separated by polarization, as required by the subject claims of the present application, but rather data and address components within each individual packet that are separated by Van Der Tol. In our arrangement complete packets are separated by polarization.

Furthermore, the Office action also states: "Therefore it would have been obvious to further include Van Der Tol's teaching of having an optical and electrical switching matrix for the received packet in order to provide the structure for the advantages discussed in claim 1" (citing col. 6, lines 52-55 for the optical and electronic switching

matrix). Rather, Van Der Tol teaches an optical switching matrix and an electronic control of the same optical switching matrix. This is fundamentally different from the approach set forth in the subject claims of letting complete packets be processed by either an electronic or an optical switching matrix, depending on the packet's state of polarization.

Regarding claim 7, it is stated in the Office action that Van Der Tol's "first optical switching matrix is a wavelength router adapted to separate payload of packets of a first class, payload of a second class and header information of the second class" (citing col. 6, lines 52-57) and that therefore "it would have been obvious to further include Van Der Tol's teaching of sorting the payload and header through a switch in order to provide the structure for the advantages discussed in claim 1". However, what Van Der Tol describes is the separating of address and data components of a packet by wavelength with the address part being used to control the switching of the data component in the switching matrix, whereas what the subject claim 7 sets out is different, in that (1) complete packets (header and payload) in the second state of polarization are separated out to the electronic switching matrix, while (2) the payload part of packets in the first state of polarization to the optical part of the switch, with the header part of the packet is separated to the electronic part of the switch.

Regarding claim 8, the recited "at least one polarization beam splitter (PBS1) and at least one optical demultiplexer" is employed for a new application and to solve a problem that has not been solved previously, namely how to separate packets of different QoS class. Van Der Tol instead uses such elements to multiplex and demultiplex an address signal A and a data signal I, two portions of the same packet, based on polarization. There is no teaching to separate complete packets of different QoS class.

Regarding claim 15, neither Kodialam nor Van Der Tol teach core nodes "adapted to switch packets electronically or optically according to which QoS class the packets are associated with". Kodialam teaches using electronic or optical cross-connects for switching circuits that may contain packets. Cross-connects are circuit switches. Neither Kodialam nor Van Der Tol teaches an electronic packet switch for switching packets (not circuits) in one QoS class and an optical cross-connect (for switching circuits with packets) or optical packet switch for switching packets (not circuits) of a second QoS class. QoS class does not serve as a basis in either reference for switching of packets.

Regarding claim 25, in which "the optical packet switched network is executing time divisional multiplexing of received packets", Kodialam's sending of LSP requests in time slots (par. [0048]) is fundamentally different from time division multiplexing of data packets.

Regarding claim 26, in which "the optical packet switched network is SOP-aligning received packets", Van Der Tol only describes the splitting of a packet's address and data field according to the two packet components' state of polarization. (Col. 6, lines 44-50) Van Der Tol does not teach re-polarizing of received complete packets in a core node. The claimed re-polarizing ("SOP aligning") includes both polarization demultiplexing and polarization multiplexing of the complete "packets" within the same node.

Regarding claim 27, in which a first packet is delayed in a FDL in a first predetermined period of time and an output is reserved where the first packet is directed to be transmitted, Van Der Tol's use of a fiber delay line (FDL) for delaying a packet payload is for a different purpose, namely achieving sufficient time for configuring the switching matrix and interpreting the address header (col. 6, lines 52-67). In our case, reservation means that we employ the FDL to reserve

an output of the switch for the incoming packet. If a packet is currently being scheduled at the desired output on the switch, the scheduling is then allowed to finish while the incoming packet is delayed. By the time the incoming packet reaches the output of the switch, the output will then be vacant. Van Der Tol doesn't teach this.

Regarding claims 3 and 20, Farries was cited for its teaching of time-interleaved orthogonally-polarized data streams (col. 5, lines 12-35). Farries teaches a system where polarization is interchanged at the beginning of each bit, for the purpose of reducing interference, allowing a better signal quality and a higher bit rate to be transmitted in a link. In contrast, the subject claims of the present application interchange the first and second states of polarization "at the beginning of each packet". A packet is a collection of multiple bits. The claimed interchanging of polarization states is for the purpose of separating packets, not increasing signal quality or transmission bit rate. Farries does not teach the claimed subject matter. We solve a different problem by employing a completely different technique for separating complete packets instead of bitwise interleaving of data streams.

Regarding claim 29, Farries' polarization interleaving of individual bits from two data streams to achieve a higher bit rate has no real connection whatsoever to the claimed polarization multiplexing of complete packets for decoding their paths through the network.

Claims 10, 30, and 31 were rejected under 35 U.S.C. 103(a) as being unpatentable over Kodialam and Van Der Tol and further in view of Fang (US 2003/0026250).

Regarding claims 10 and 30, Fang was cited (par. [0007]) for teaching network systems with IP traffic for best effort service and traffic for guaranteed service, albeit in different types of networks (ATM overlay for best effort

service, but MPLS based packet switching for guaranteed service). In our system, best effort (BE) packets are assigned to the second QoS class, while guaranteed service (GS) packets are assigned to the first QoS class, and thus are given different states of polarization based on these QoS assignments, which is not taught in any of the cited references and is fundamentally different from those prior approaches.

Regarding claim 31, in which GS-packets are forwarded optically using an optical switch and BE-packets are forwarded electronically using an electronic switch, it is not correct as the Office action asserts (page 12) that Van Der Tol teaches use of an electronic switching matrix in combination with an optical switching matrix (citing col. 6, lines 52-55). Rather, Van Der Tol uses solely optical polarization multiplexing, but employing electronic address interpretation and control of the optical switching matrix. Further, while Fang teaches network systems that have best effort service or guaranteed service, as noted for claims 10 and 30, in our claimed system, best effort (BE) packets are packets switched electronically, while guaranteed service (GS) packets are forwarded optically along predetermined wavelength paths using an optical switch. Switching of GS packets optically and BE packets electronically, based on separation (assigned QoS class) by polarization is not obvious in light of the cited prior art.

Claim 11 was rejected under 35 U.S.C. 103(a) as being unpatentable over Kodialam, Van Der Tol, and Farries, and further in view of Fischler et al. (US 2008/0019692).

Fischler was cited for the teaching (par. [0009]) of switching of wavelength groups (WDM channels) wherein the wavelength groups are also polarized (polarization multiplexing). However, claim 11 also recites "means for separating packets by changing state of polarization at the

beginning of every new packet". Farries was cited for allegedly teaching this claimed feature, but as already argued above with respect to claims 3, 20, and 29, Farries actually teaches only bitwise (not by packets) interleaving of data strains by polarization, i.e., the interchange of polarization of each bit. The method set forth in claim 11 is therefore not obvious. The cited combination of references does not reach the claimed subject matter as a whole.

Claim 12 was rejected under 35 U.S.C. 103(a) as being unpatentable over [Kodialam], Van Der Tol, and Maher, III et al. (US 7,058,974), and further in view of Fludger et al. (US 2004/0218933).

The relevance of Maher was not stated, but appears to simply teach the use of data packet priority assignments for preventing denial of service attacks, particularly by assigning lower priority to data packets associated with non-validated traffic. There appears to be no mention of providing different states of polarization to traffic of different QoS class.

Fludger was cited for teaching (par. [0020]) more than two states of polarization (linear, circular, elliptical) in an optical communication system. Fludger does not teach that the different polarization may be used for QoS labeling of packets. Unlike Fludger (par. [0042]), the present claimed matter is not for the purpose of increasing capacity, but rather being able to differentiate packets according to their QoS class. Employing more than two states of polarization allows us to designate more than two QoS classes. Hence we use polarization in new ways to solve a different problem from any of those in the cited art.

Claims 13, 16, and 17 were rejected to under 35 U.S.C. 103(a) as being unpatentable over [Kodialam], Van Der Tol, Maher, and Fischler.

Regarding claim 13, we note that the argument (page 15) relies on Kodialam (citing par. [0028]), but not Maher. Fischler was cited as teaching (par. [0009]) switching of wavelength groups where the wavelength groups are also polarized. Claim 13 recites "an optical packet switched module attached to a S-WRON node". This combination is for switching the BE and GS packets in two different types of switches, which solves a fundamentally different problem than any suggested by the references. It is not simply the application of polarization multiplexing for transmitting more information that is argued in the Office action.

Regarding claims 16 and 17, these are patentable for the same reasons given above for claim 15 from which they depend.

Claims 23 and 24 were rejected under 35 U.S.C. 103(a) as being unpatentable over Kodialam and Van Der Tol in view of Maher (US 7,058,974).

Maher was cited for teaching routing of packets based on routing in QoS information handled by a header processor (citing col. 7, lines 1-8). However, none of the references including Maher, label a packet's QoS class by way of the polarization state, whereby packets are routed according to such polarization state. These claims are patentable for the reasons given above for claim 18.

Claim 28 was rejected under 35 U.S.C. 103(a) as being unpatentable over Kodialam and Van Der Tol, and further in view of Koga (US 2002/0141446).

Koga was cited for teaching that a maximum delay time and a maximum packet length are based on a QoS of a packet (par. [0049] and [0051]). However, Koga does not disclose encoding this QoS information in a packet's polarization state, as in claims 18 and 22 from which claim 28 ultimately depends. None of the cited references teach this

feature, so claim 28 is deemed to be patentable in light of the arguments given above for those base claims.

Claim 9 was objected to as being dependent upon rejected base claim 1 but was indicated to be allowable if rewritten in independent form. Applicant declines to rewrite claim 9 at this time in light of the arguments for patentability of the independent claim.

Conclusion

Applicant requests reconsideration of the claims in view of the amendments and remarks made herein. A Notice of Allowance is earnestly solicited.

CERTIFICATE OF TRANSMISSION

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being transmitted via the Office electronic filing system in accordance with § 1.6(a)(4) on the date shown below.

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